

# Superfund Sites Unit Plan

**Topic:** Hazardous Materials and Superfund Sites

**Grade Level:** 7-10

**Instructional Setting:** Classroom with computer access. 5-40 students

## Academic Outcomes/Student Objectives:

Students will:

- Define and explore the relationship between hazardous substances and hazardous waste
- Evaluate the impact of risk on the basis of probabilities, benefits, and their perceptions
- Conduct research to collect reports from newspapers, T.V., the internet, and the radio on national hazardous waste issue
- Discuss what activities produce hazardous waste and how contaminants are released and spread through the air, water, soil, and ground water.
- Learn what kinds of pollution can be cleaned up using Superfund authority and what types are addressed through other laws and how the EPA tries to encourage communities near superfund sites to become involved in the superfund process. They will also examine the legislative process is developed, enacted, and enforced.
- Construct a model to observe how contaminants move through ground water.
- Understand the different types of risk found at superfund sites and how those risks are evaluated and addressed.
- Understand some of the reasoning and science involved in choosing technologies for cleaning up hazardous waste sites.
- Write persuasively, descriptively, and creatively suggesting options for the future of superfund sites, potential future scenarios dealing with hazardous waste, and express their feelings about the treatment of the environment.

**Process Skills Addressed:** Writing business letters, critical and analytical thinking and writing, persuasive writing and speaking, creative writing, problem solving, hypothesizing, testing hypotheses through experimentation, predicting and critiquing outcomes, mathematical probability

**Materials Needed:** Access to research materials including internet, non-fiction materials, local EPA or other Hazardous Waste experts; see individual activities for activity materials.

**Safety Precautions:** This is only a consideration if instructor takes students to a superfund site.

**Total Time for Unit Plan:** Twenty days at 45 minutes per class period.

**Pre-Assessment:** Students write a business letter, using whatever background knowledge they have to recommend safe changes are made at a local superfund site. This letter is written to a state legislature. (Without content information, students are expected to write with emotion, assumptions, and vague opinions rather than scientifically researched data.)

**Post-Assessments: Service Project:** Students write a business letter, using scientifically researched data that they have learned from the unit to recommend safe changes are made at a local superfund site. Students may choose which letter to send-the pre-assessment or the post-assessment.

**Post-Assessment: Standardized Assessment:** Students answer a series of multiple choice, short constructed response, and fill-in-the-blank questions about the content information they learned in this unit.

**Glossary:** [http://www.epa.gov/superfund/students/clas\\_act/haz-ed/dglossary.htm](http://www.epa.gov/superfund/students/clas_act/haz-ed/dglossary.htm)

## **Standards Covered:**

### **Colorado**

**Literacy Standard 2:** Students write and speak for a variety of purposes and audiences. In order to meet this standard, students will,

- Supporting an opinion using various forms of persuasion (factual or emotional) in speaking and writing;
- Incorporating material from a wider range of sources (for example, newspapers, magazines, interviews, technical publications, books) in their writing and speaking;
- Writing in various specialized fields such as career and academic interest areas (for example, scientific, technical, business, and communications);

**Literacy Standard 4:** Students apply thinking skills to their reading, writing, speaking, listening, and viewing. In order to meet this standard, students will,

- Use reading, writing, listening, articulate speaking, and viewing to solve problems;

**Science Standard 1:** Students understand the processes of scientific investigation and design, conduct, communicate about, and evaluate such investigations. In order to meet this standard, students will,

- Ask questions and state hypotheses, using prior scientific knowledge to help guide their development;
- Create and defend a written plan of action for a scientific investigation;
- Select and use appropriate technologies to gather, process, and analyze data and to report information related to an investigation;
- Communicate and evaluate scientific thinking that leads to particular conclusions;
- Recognize and analyze alternative explanations and models;

**Science Standard 3:** Life Science: Students know and understand the characteristics and structure of living things, the process of life, and how living things interact with each other and their environment. To meet this standard, students will,

- Students know and understand the characteristics of living things, the diversity of life, and how living things interact with each other and with their environment.

**Science Standard 5:** Students know and understand interrelationships among science, technology, and human activity and how they can affect the world. To meet this standard, students will,

- Analyze benefits, limitations, costs, and consequences involved in using technology or resources (for example, X-rays, agricultural chemicals, natural gas reserves);
- Demonstrate the interrelationships between science and technology (for example, building a bridge, designing a better running shoe);

**Math Standard 3:** Students use data collection and analysis, statistics, and probability in problem-solving situations and communicate the reasoning used in solving these problems. To meet this standard, students will,

- Use experimental and theoretical probability to represent and solve problems involving uncertainty

**Utah:**

**Math Standard 5200-11** Probability An understanding of probability and the related area of statistics is essential to being an informed citizen.

- 5200-1101 Model situations by devising and carrying out experiments or simulations to determine probabilities
- 5200-1102 Model situations by constructing a sample space to determine probabilities.
- 5200-1103 Compare experimental results with mathematical expectations in order to appreciate the power of using a probability model.
- 5200-1104 Make predictions that are based on experimental or theoretical probabilities

**Science Standard 3600-01** Students will investigate biological systems and summarize relationships between systems

- 3600-0101 Analyze the functioning of a biological system
  - identify biotic and abiotic factors in a system
  - relate the effects of organisms on the environment and the effects of the environment on organisms
- 3600-0102 determine how systems relate within the biosphere
  - identify interactions between systems
  - explain how natural forces affect biological systems
- 3600-0104 evaluate the influence of people on the biosphere
  - identify positive and negative impacts of human activities on the biosphere
  - research and analyze an issue related to the use of biological resources
  - design and implement a plan to positively affect the biosphere

**Science Standard 3560-07:** Students will investigate the interdependence of organisms with each other and with their environment.

- Identify factors that affect a population's growth

**Literacy Standard 4070-03:** Students use comprehension strategies after reading to reflect on, consolidate, and extend meaning.

- 4070-0301 Summarize and/or synthesize important information from text.

**Literacy Standard 4070-05:** Students read functional, informational, and literary text from different periods, cultures, and genres

- 4070-0501: demonstrate competency in reading and interpreting functional text.

**Literacy standard 4080-01:** Students use comprehension strategies before reading. 4080-0203 Build vocabulary by using a variety of strategies

Literacy Standard 4100-07: Students use composing strategies before writing.

- Establish a purpose for writing
  - Write to express an opinion
  - Write to convey information
  - Write to express creativity
  - Write to persuade